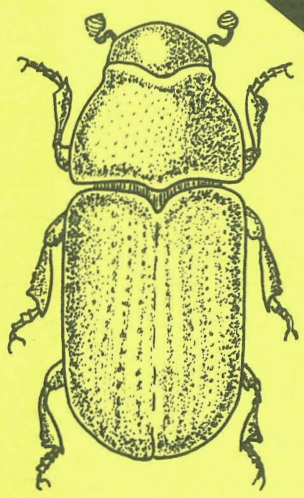
J. Watters

R-3 74-23

BIOLOGICAL EVALUATION
Ponderosa Pine Mortality

Horsethief Basin
Recreation Area,
Crown King Ranger
District,
Prescott
National
Forest,
Arizona



Southwestern Region

U. S. DEPARTMENT OF AGRICULTURE

FOREST SERVICE

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Branch of Forest Insect and Disease Management
Division of Timber Management
Southwestern Region, USDA, Forest Service
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INTRODUCTION

Over the years, ips bark beetles have caused widespread and often extensive damage to the ponderosa pine forests of central and southern Arizona. The Arizona five-spined ips is perhaps the most destructive species.[1] Periodically, large populations of this species develop in sapling- and pole-size stands and kill many trees. Outbreaks are usually associated with stand disturbances from fire, logging, and windthrow. These create a large amount of freshly killed material ideal for brood development. Occasionally, poorly growing trees become infested. Once a large population builds up, green standing trees are often attacked and killed.

The ponderosa pine stands of the Prescott National Forest have had a history of chronic ips beetle outbreaks. The most serious problems have resulted from stand disturbances following logging or thinning. The present outbreak on the Crown King Ranger District is occurring in an area where stand disturbances have been minimal. The problem is most serious in the Horsethief Basin Recreation Area, where many aesthetically important trees are being killed. Southwestern dwarf mistletoe is present in and around this high-use recreation area[2] and has caused limited mortality there in recent years. Dwarf mistletoe suppression by pruning infected overstory trees was conducted in the area during 1970.[3] This report evaluates the causes and extent of the ponderosa pine mortality in Horsethief Basin and recommends suppression measures necessary to reduce losses.

TECHNICAL INFORMATION

Insects.--Arizona five-spined ips, Ips lecontei Swaine
Sawtooth pine engraver, Ips plastographus (Leconte)

Disease.--Southwestern dwarf mistletoe, Arceuthobium vaginatum subsp. cryptopodum (Engelm.) Hawksworth and Wiens

Host.--Ponderosa pine, Pinus ponderosa var. scopulorum Engelm.

Location and Extent of Problem.--The problem area is located in Horsethief Basin at the southern end of the Bradshaw Mountains, approximately 4 miles southeast of Crown King and 30 miles southeast of Prescott, Arizona (Fig. 1). Dying trees are evident

1/ Massey, C. L. 1971. Arizona five-spined ips. USDA, Forest Serv., Forest Pest Leafl. 116. 5 p., illus.
2/ Dwarf mistletoe survey: Prescott National Forest. 1972. USDA, Forest Serv. 16 p., illus. (Unpublished office report).
3/ Weiss, M. J. 1971. Post-treatment evaluation: Horsethief Basin dwarf mistletoe. USDA, Forest Serv., Reg. 3. 2 p. (Unpublished office report).

CROWN KING RANGER DISTRICT
PRESCOTT NATIONAL FOREST

ARIZONA

1972

Scale

1 ½ 0 1 2 3 4 5 Miles

LEGEND

Ranger District Boundary

▪▪▪▪▪▪▪▪-Location of Ponderosa Pine Mortality

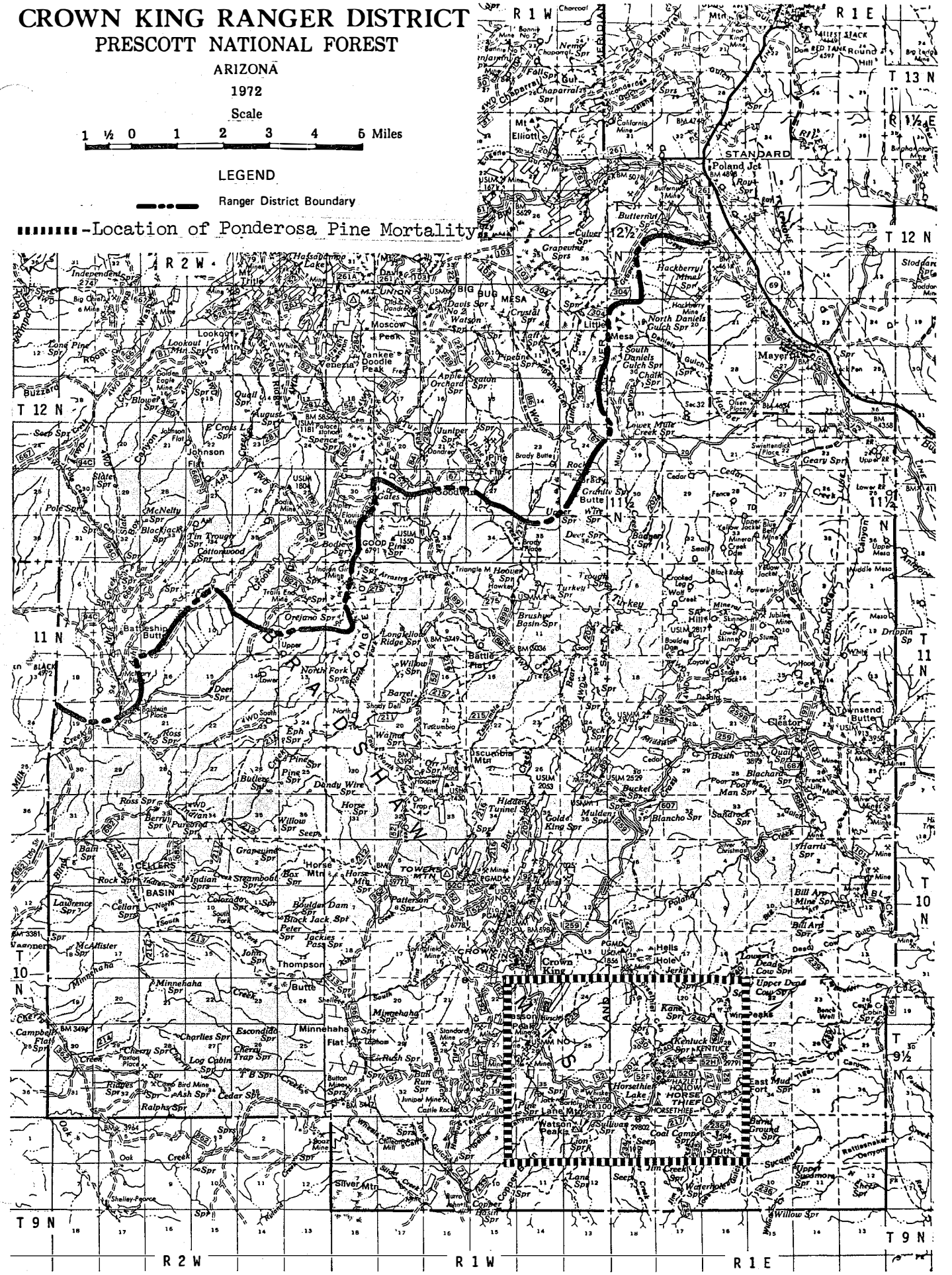

Fig. 1

throughout about 12,000 acres of ponderosa pine type on the Crown King Ranger District around Horsethief Basin Recreation Area, Horsethief Lookout, and the Senator Road (FR 52) between Crown King and these points.

Type of Damage.--Standing green trees of all size classes are dying in groups of 5 to 20. Some dying trees are severely infected with dwarf mistletoe, but many are only lightly infected or free from infection.

METHODS

The problem area was surveyed from both the ground and the air. On April 10, 1974, the author, with Bill Wilson, Prescott Supervisor's Office, and Larry Miller, Crown King Ranger District, ground checked several groups of dying trees in the Horsethief Basin Recreation Area. Bark samples were taken at breast height from several trees in each group examined. One fading tree was cut down and the upper bole examined. All bark beetles found were collected and taken to our Albuquerque laboratory for identification. Most of the dying trees were checked for dwarf mistletoe, but only its presence or absence was noted.

On April 18, 1974, an aerial reconnaissance of the problem area was made by the author and Emmett Wilson, biological technician with our staff. Bill Wilson also was present. The extent of the problem area was noted and a sketch map prepared to show the centers of spots where trees were dying.

RESULTS AND DISCUSSION

Observations revealed a great many groups of dying trees throughout the ponderosa pine type in Horsethief Basin (Fig. 2, 3, and 4). Only the tops of certain trees in a group had been killed, while others were infested for their entire length (Fig. 5). Top-kill is characteristic of ips bark beetles. Indeed, two species of ips were collected: Ips lecontei and I. plastographus. The first species was the most abundant and presents the greatest threat to standing green trees.

A great many adult beetles were found hibernating in trees killed last fall. New attacks, with oviposition already started, were evident in the upper bole of one green tree. Thus, it appears that overwintering adults have begun to fly and attack trees. Without

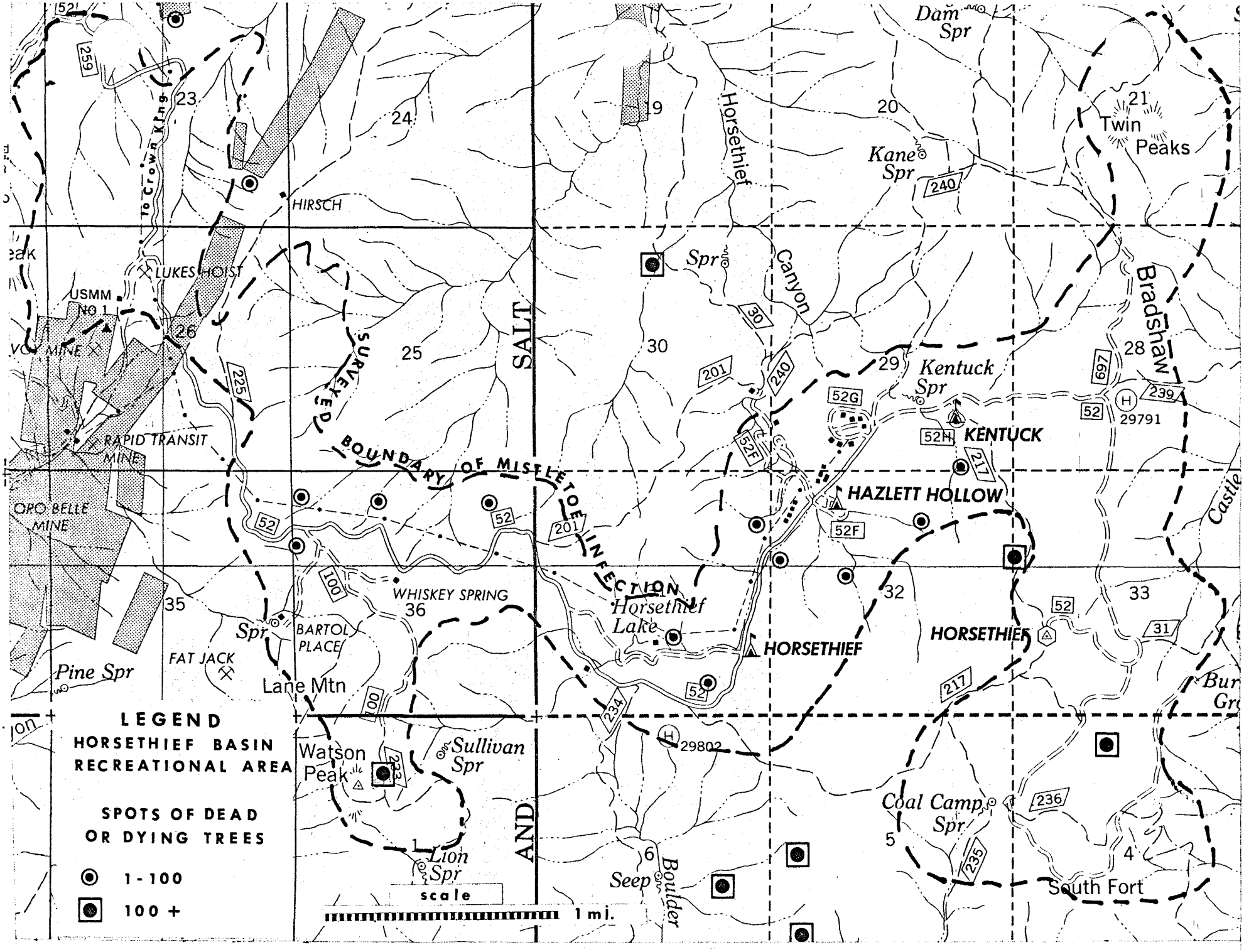
LEGEND
HORSETHIEF BASIN
RECREATIONAL AREA
SPOTS OF DEAD
OR DYING TREES
1 - 100
100 +
scale
1 mi.
SURVEYED BOUNDARY OF MISTLETOE INFECTION
SALT AND
Dam Spr
Twin Peaks
Kane Spr
Horsethief Canyon
Bradshaw
Kentuck Spr
KENTUCK
HAZLETT HOLLOW
HORSETHIEF
Horsethief Lake
HIRSCH
LUKES HOIST
USMM NO 1 MINE
RAPID TRANSIT MINE
ORO BELLE MINE
WHISKEY SPRING
BARTOL PLACE
FAT JACK
Pine Spr
Lane Mtn
Watson Peak
Sullivan Spr
Lion Spr
Seep
Boulder
Coal Camp Spr
South Fort
To Crown King
29791
29802

Fig. 3.--Ponderosa pine trees killed in 1973, looking west from Horsethief Lookout.

Fig. 4.--Ponderosa pine trees killed in 1973, looking south from Horsethief Lookout.

Fig. 5.--Ponderosa pines infested with the Arizona five-spined ips beetle in 1973.

natural controls, this spring brood will complete development by late June, emerge and either attack the lower boles of top-infested trees or the tops of adjacent live trees. Attacks will continue during the summer until the trees are completely infested. Since these beetles will have several generations before next winter, large populations are expected to build up in the problem area and cause extensive tree mortality.

Southwestern dwarf mistletoe was noticeable on some of the dying trees examined. A more thorough investigation would probably reveal a greater incidence, since the parasite is known to be present throughout Horsethief Basin (Fig. 2). Infected trees are less vigorous than healthy ones, and heavy infections cause growth loss and mortality.

Non-biotic factors also appear to be responsible for weakening trees. Low precipitation and above normal temperatures during the last winter have left the trees without sufficient soil moisture for the present growing season. The trees are growing on shallow, rocky soils where growth is slow, even when moisture is abundant.

There is little doubt that large populations of ips beetles have built up in trees weakened by a complex of factors. Drought conditions, marginal sites, and a high incidence of dwarf mistletoe infection have all combined to reduce tree vigor and increase susceptibility to ips attack.

RECOMMENDATIONS

A four-part program should be initiated to reduce ponderosa pine mortality and recreation hazards from dead trees within the Horsethief Basin Recreation Area. The area to be covered includes Hazlett Hollow, Kentuck Spring, and Turney Gulch Campgrounds; the Summer Homes Area; and that part of the Senator Road which runs through the recreation area.

The following phases constitute the program:

1. Immediate reduction of ips beetle populations within the recreation area.

2. Reduce recreation hazard by removing ips-killed trees from within recreation area.

3. Prevent reinfestation of the recreation area from ips populations in the surrounding forest.

4. Increase tree vigor through dwarf mistletoe suppression in the recreation area.

To achieve the first phase of the program, immediate ips suppression, we recommend felling trees infested this spring and completely disposing of them before the end of July. The attack pattern of ips often makes it difficult to determine if a tree is actually infested. Spring attacks begin in the upper bole, but the resultant fading top may not be evident from the ground until a few weeks later. By mid-June, most trees infested during the spring should be easy to identify for treatment. Some spring-infested trees may escape early detection, but these will become quite evident during the summer. As attacks continue on the lower bole, the fading progresses downward until the entire crown becomes yellow.

All logs and limbs more than 3 inches in diameter from infested trees should be treated. Limbs less than 3 inches dry out rapidly and are unsuitable for ips survival. Infested material can be treated by one or more of the following methods: burning, chipping, hauling from ponderosa type, or covering with clear polyethylene. If the polyethylene method is used, infested material should be piled in open areas and covered with 4-mil clear polyethylene sheeting.[4/] The piles should be placed in full sunlight. All protruding branches should be trimmed off to prevent snagging the plastic. The edges of the plastic should be buried to maintain bark temperatures lethal to ips. Each pile must be covered for at least 4 weeks.

Phase two of the program deals with recreation hazard reduction. Ips-killed trees in the recreation areas and along the travel influence zone within these areas may present a hazard to recreationists, their equipment, and recreational facilities. Where such a hazard exists, it should be reduced by felling and disposing of dead trees in a timely manner. Since dead trees are no longer suitable for ips development, they may be used for firewood or other recreation uses.

The third phase of the program, preventing reinfestation, involves creating trap logs within infestation centers adjacent to the recreation area. Since freshly cut logs and slash are readily attacked by ips, and attacks are continuous during the summer, green trees felled during this time can be used to attract ips adults. We recommend felling live trees within an infestation

4/ Buffam, P. E., and D. D. Lucht. 1968. Use of polyethylene sheeting for control of Ips spp. in logging debris. J. Econ. Entomol. 61: 1465-6.

center in late June and using one of the methods described in phase one, above, to treat the trap logs. However, all felled trees must be treated by the end of July to prevent the emergence of large populations from the cut material. Timing of the treatment is most critical and must be given the highest priority. If tree losses continue, a second trap-log treatment may be necessary later in July or August to achieve further ips population reduction.

The fourth phase of the program involves efforts to increase tree vigor through dwarf mistletoe suppression. Dwarf mistletoe-infected branches from selected overstory trees were pruned during 1970 in Hazlett Hollow and Turney Gulch Campgrounds. These and other campgrounds should be re-examined and a follow-up treatment performed where necessary. The infected trees in the campgrounds have been tagged for easy identification and their location is documented.5/ By pruning dwarf mistletoe-infected branches, tree vigor can be increased and tree life prolonged.

Forest insect and disease suppression funds are available to help finance removal and treatment of ips beetle-infested trees and pruning dwarf mistletoe-infected branches. Removal of dead trees which represent a potential fire and recreation hazard in the developed recreational areas is recommended, but cannot be financed with these funds. Where pest control funds are used, a cost-benefit evaluation and environmental impact evaluation should accompany the project proposal. Our forest pest management personnel are available to assist in the preparation of these documents and each operational phase of the proposed program.

5/ Weiss, M. J. 1970. Presuppression survey report, dwarf mistletoe, Horsethief Basin Recreation Area. USDA, Forest Serv., Reg. 3. 12 p. (Unpublished office report).